ANALYSIS OF MULTICHANNEL SIGNALS USING A CHANNEL SIMULATOR

Luis A. Palacio and Horia I. Petrache (Horia I. Petrache), Department of Physics, Indiana University–Purdue University Indianapolis, Indianapolis, Indiana 46202

In biological systems ion channels can be thought of as opening and closing pores that allow the flow of ion through a membrane. Ion channels are responsible for intracellular communication and keeping an osmotic equilibrium across cell membranes. Measurements of ion channel activities that generate multichannel events (the opening of more than one channel at a time) are important to understand, but difficult to analyze. In many cases the multichannel events are discarded instead of used in the analysis. The availability of a channel signal simulator offers an excellent opportunity to develop and test statistical models for analysis of multichannel signals. We have generated single channel traces for various open probabilities and then digitally superimposed these signals to obtain multichannel events. We then applied our simplified analysis to these multichannel traces to calculate single channel parameters such as the average ON and OFF times and their statistical distribution of the ON times. The average ON time as well as the ON time distribution matched the single channel input mean open time. The importance of our findings is that our proposed analysis will be able to use the statistical distribution of ON times, in addition to the traditional “dwell time” (or average ON time) parameter, to characterize ion channels.